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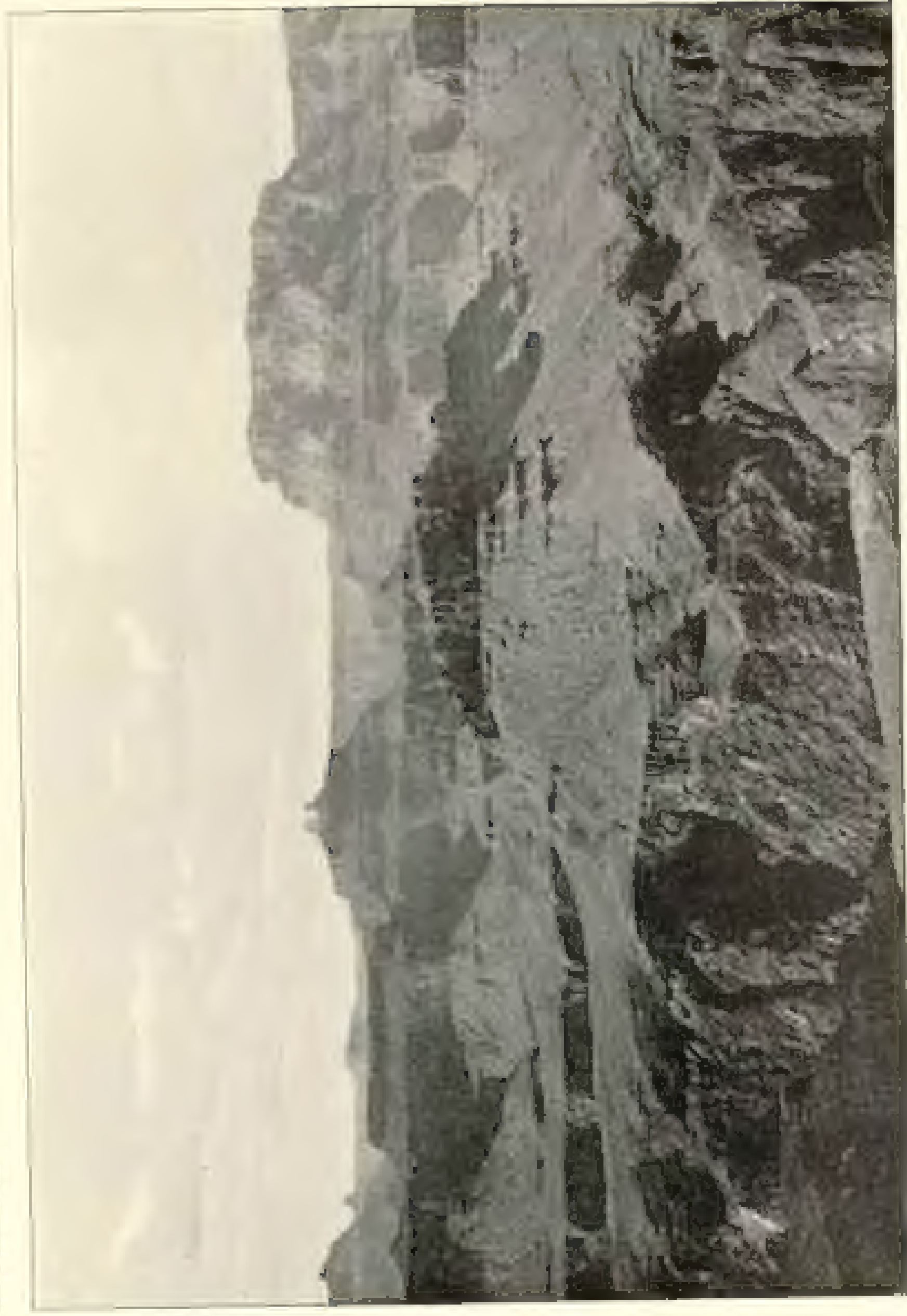
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TYPICAL VIEW FROM THE BRINK OF THE GRAND CANYON OF THE COLORADO

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THE VENEZUELAN BOUNDARY COMMISSION AND ITS
WORK

By MARCUS RAKEB

Cartographer, U. S. Geological Survey

On the northeast shoulder of South America, between the mouths of the great rivers Amazon and Orinoco, lies Guiana. On the extreme east and nearest the Amazon is French Guiana, or Cayenne; just west of this is Dutch Guiana, or Surinam, while the next division to the west is British Guiana, a colony of Great Britain; and this in turn is bordered on the west by Venezuela, one of the South American republics.

Between these last two, British Guiana and Venezuela, current maps show a boundary line which, starting at or near the southern mouth of the Orinoco (for there are many mouths in its 150-mile-wide delta), runs in a southerly direction into the interior. This line, speaking in only the most general terms, is the now famous Schomburgk line. This boundary is in dispute, and has been so for more than half a century. It has been a source of prolix and interminable diplomatic correspondence and negotiation, a correspondence couched in politest phrase, without concealing the earnestness, nay, bitterness, underneath. Proposals and counter-proposals had been made, but without success. Arbitration had been proposed, but until recently Great Britain had steadily refused to submit the entire disputed territory to arbitration. So the case dragged on for weary years. Finally, in 1896, some 10 years ago, Venezuela severed diplomatic relations with Great Britain and sent her official representative away.

Venezuela then sought to bring about indirectly, through the friendly aid of a third power, a settlement of the long standing

and irritating controversy. The matter was taken up by our own foreign office (the Department of State) and correspondence carried on in 1895 between Secretary Olney and Lord Salisbury. Secretary Olney, in a document resembling a lawyer's brief much more than it does the ordinary diplomatic dispatch, stated the case as it appeared to him and asked that it be arbitrated. To this Lord Salisbury replied in two careful and most courteous dispatches (as diplomats are wont to call letters), declining general arbitration.

Thereupon President Cleveland, on December 17, 1895, sent to Congress this correspondence, accompanied by a brief but now famous message—a message of which, without exaggeration, it may be said that it startled the civilized world. After summarizing the correspondence and commenting upon Lord Salisbury's two replies, President Cleveland proceeded as follows:

In the belief that the doctrine for which we contend (the Monroe doctrine) was clear and definite, that it was founded upon substantial considerations and involved our safety and welfare, that it was fully applicable to our present conditions and to the state of the world's progress, and that it was directly related to the pending controversy, and without any exception as to the final merits of the dispute, but anxious to learn in a satisfactory and conclusive manner whether Great Britain sought, under a claim of boundary, to extend her possession of territory fairly included within her lines of ownership, this government proposed to the government of Great Britain a resort to arbitration as the proper means of settling the question, to the end that a vexatious boundary dispute between the two contestants might be determined and our exact standing and relation in respect to the controversy might be made clear.

It will be seen from the correspondence herewith submitted that this proposition has been declined by the British government upon grounds which, in the circumstances, seem to me to be far from satisfactory. It is deeply disappointing that such an appeal, actuated by the most friendly feelings toward both nations directly concerned, addressed to the sense of justice and to the insignificance of one of the great powers of the world and touching its relations to one comparatively weak and small, should have produced no better results.

The course to be pursued by this government, in view of the present condition, does not appear to admit of serious doubt. Having labored faithfully for many years to induce Great Britain to submit this dispute to impartial arbitration, and having been now finally apprised of her refusal to do so, nothing remains but to accept the situation, to recognize its plain requirements and deal with it accordingly. Great Britain's present proposition has never thus far been regarded as admissible by Venezuela, though any adjustment of the boundary which that country may deem for her advantage and may enter into of her own free will cannot of course be objected to by the United States.

Assuming, however, that the attitude of Venezuela will remain unchanged, the dispute has reached such a stage as to make it now incumbent upon the United States to take measures to determine with sufficient certainty for its justification what is the true divisional line between the Republic of Venezuela and British Guiana. The inquiry to that end should of course be conducted carefully and judicially, and due weight should be given to all available evidence, records, and facts in support of the claims of both parties.

In order that such an examination should be prosecuted in a thorough and satisfactory manner, I suggest that the Congress make an adequate appropriation for the expenses of a commission, to be appointed by the Executive, who shall make the necessary investigation and report upon the matter with the least possible delay. When such report is made and accepted it will, in my opinion, be the duty of the United States to resist by every means in its power as a willful aggression upon its rights and interests the appropriation by Great Britain of any lands or the exercise of governmental jurisdiction over any territory which, after investigation, we have determined of right belongs to Venezuela.

In making these recommendations I am fully alive to the responsibilities involved and keenly realize all the consequences that may follow.

I am nevertheless firm in my conviction that while it is a grievous thing to contemplate the two great English-speaking peoples of the world as being otherwise than friendly competitors in the onward march of civilization and strenuous and worthy rivals in all the arts of peace, there is no calamity which a great nation can invite which equals that which follows a supine submission to wrong and injustice and the consequent loss of national self-respect and honor, beneath which are shielded and defended a people's safety and greatness.

This short message went to Congress December 17, 1895, where it was read and referred to the Committee on Foreign Affairs. The following day, December 18, the chairman of that committee, the Hon. R. R. Hitt, reported a bill (H. R. 2173) appropriating \$100,000 for the expenses of a commission to investigate and report upon the true divisional line between British Guiana and the Republic of Venezuela. This bill was passed by the House of Representatives forthwith and unanimously; it was then sent to the Senate. It was on the following day, the 19th of December, referred to the Committee on Foreign Relations in the Senate. The next day it was reported back, debated, and passed without amendment. The following day, December 21, it was a law, having received the signatures of the Speaker of the House, the Vice-President, and the President. Thus President Cleveland's suggestion on December 17, that a commission be created, was four days later the law of the land, and made so with an unanimity almost, if not quite, unparalleled. No vote

against it was recorded in either branch of Congress. On January 4, 1897, the commission was appointed, and consisted of five persons, viz :

Hon. David J. Brewer, one of the justices of the Supreme Court of the United States ; Hon. Richard H. Alver, Chief Justice of the Court of Appeals of the District of Columbia ; Mr Frederick E. Coudert, a distinguished member of the New York bar, who had acted as counsel for the United States in the Hering Sea arbitration case ; Hon. Andrew D. White, Historian and diplomatist, and Dr Daniel C. Gilman, a learned geographer, president of the Johns Hopkins University. This commission organized by electing Mr Justice Brewer president and Mr Severo Mallet-Prevost, of the New York bar, as secretary.

Upon this commission were laid two duties: *first*, to investigate, and *second*, to report. Obviously investigation was first, not merely in order, but in the amount of labor involved and in importance. In the early sessions of the commission the whole subject was canvassed, and the work of investigation planned, organized, and assigned. Professor George L. Burr, of Cornell University, a painstaking and accurate historian and linguist, was sent to Holland to investigate the Dutch archives. Later on he was joined there by Mr Coudert, of the commission. For assistance in the preparation of maps and in geographical investigation, application was made to the U. S. Geological Survey. To this work I was assigned, and from January to May, 1896, gave to it such time as could be spared from Survey duties. In May, 1896, I was, however, detailed to the service of the commission, and continued to serve on this detail till the close of the commission's labors and the publication of its results in June, 1897.

When, in November, 1896, it was made known that Great Britain and Venezuela had at last come together and had agreed to submit their dispute to arbitration, the commission found itself set free from the need of pronouncing judgment. As the contending parties had themselves agreed to submit their differences to an arbitral tribunal, it was obviously for that tribunal to pronounce judgment. Moreover, as Mr Justice Brewer had been chosen as a member of the arbitral tribunal, it was obviously improper that he should pronounce judgment in advance of his sitting with that tribunal. The commission accordingly decided to withhold any conclusions it might have reached and to publish only its investigations. Thus the facts gathered have become public property. The investigations undertaken were unfinished

when arbitration was agreed upon, but the commission decided to stop short and print in as complete and systematic form as time permitted the facts then gathered.

The facts gathered by the commission are set forth in three octavo volumes and an atlas comprising 76 maps. The atlas constitutes volume 4 of the report and was the first volume completed. It is composed, as above stated, of 76 maps, divided into three groups or parts.

Part I comprises 15 maps, all printed on the same base. This base map was specially compiled and engraved for the commission, and is designed to represent the latest and best information as to the natural features of the Orinoco-Esequibo region. It is based chiefly on the so-called great map of the colony, dated 1875, and published by E. Stanford, of London, in 1877. Various other maps were also made use of in its compilation. The disputed territory along the seacoast is so differently shown on maps of high authority that a compromise seemed impossible, and accordingly two different maps of the same tract are shown side by side on the base map. Map 1 shows various boundary lines proposed or claimed, map 2 the forests and savannas, map 3 the principal drainage basins, and map 4 the geology of the region as far as known. Maps 5 to 14 are historical maps, showing European occupation at various dates from the earliest down to 1814. "These eleven historical maps," says Professor Burr, "have been prepared to illustrate my report on the evidence of Dutch official documents as to occupation and claims in the region between the Esequibo and the Orinoco, and are an attempt to show graphically the conclusions reached by that report." It may be noted in passing that if title to the disputed tract is to be determined by occupation, these maps showing occupation are of great significance and importance.

Part II of the atlas comprises 41 maps, facsimile reproductions of the "mother maps" of the region—produced during a period of about 300 years. Volume 3 of the commission's report contains a paper by the secretary, Mr Severo Mallet-Prevost, on the Cartographical Testimony of Geographers. The 41 maps mentioned illustrate that report and exhibit the gradual evolution of our geographical knowledge of the disputed area, and also the evolution of the various boundary lines. It constitutes an interesting and instructive group of maps and makes available for students a number of scarce ones.

Part III comprises 25 maps of an official or semi-official character, of which 12 are from manuscript originals not hitherto published. The origin of these maps, their character and meaning are set forth by Professor Barr in a paper in volume 3.

In describing the atlas, we have in part anticipated the description of volume 3, which is devoted to geography. It is an octavo volume of 517 pages and contains 6 papers. The first is by the secretary of the commission on the cartographical testimony of geographers. In its 80 pages the historical evolution of lines showing territorial division are worked out with great care, and the size of the paper inadequately measures the labor needed to gather and arrange and clearly set forth and discuss the facts therein contained.

The second paper is by Dr Justin Winsor, librarian of Harvard College, and it deals with the same topics as the preceding paper, but in a different manner. This paper was submitted to the commission very early, its date being March 4, 1896, just two months after the commission was appointed. The third and fourth papers are by Professor Barr.

The fifth paper, entitled Notes on the Geography of the Orinoco-Kassiquibo Region, South America, is by the present writer. It consists of a prosaic compilation of statements made by various travelers and explorers in the region as to its geography, with references, in foot-notes, to the sources of these statements. All the geographic names found applied in the region, whether now in use or not, were recorded in these notes, which are fully indexed. Thus it is possible to proceed quickly by means of the index and foot-notes to the original sources of geographic information touching any part of the country described in these notes.

The last paper in the volume is a partial list of maps of the region, also prepared by the writer. It was hoped to make an exhaustive list, but time did not suffice for this, nor for the preparation of a bibliography of the region.

Volume 2 is given mainly to extracts from Dutch archives. There are 353 of these extracts, comprising 662 pages. They are printed in double columns, the original Dutch forming one column and the English translation the parallel column. Some miscellaneous manuscript documents, filed with the commission by the government of Venezuela, close the volume.

Volume 1, first in order but last to be published, is now in press and will shortly be published. It is to contain the report

of the same sort, which, however, is not true to the world.

10th, 50th Congress, 1st session. It is to contain also a report by Professor J. F. Johnson, of Brown University, on the Treaty of

1808, in which are also bearing upon the boundary matter.

or relative the map, a part of volume 2. Professor Burr's report, however, will tell a contrasting story of Dutch occupation and doings in the disputed territory, as gathered from these old manuscript chronicles of the Dutch.

With the publication in the summer of 1897 of these four vol-

be transferred to a new tribunal—a tribunal of arbitration, to be composed of five of the world's leading jurists.

The commission, whose work pretends to be a return deed, wholly a United States commission. The United States declares it created in, and maintained by, and it did this "to determine with sufficient certainty, for its own justification, what is the true boundary line between British Guiana and Venezuela. It is a long and difficult to the character of the commission that is a great and true and venerable principle of international law to the fullest extent by furnishing information by and treaty. Yet it was bound so to do, and neither had agreed to accept any conditions. But it has proposed a board of arbitration, if I may say so, might well be turned into an actual arbitration—an arbitration where all the

been reached. With the long-continued controversy was a way to a peaceful, sincere, just, and free determination; an agreement to arbitrate had been reached.

before was a powerful agency toward securing the much-desired peace, and a not want of doubt, so it is the present operation. Such is too opinion of the commission itself which in its report says: "A wise and just view of the case is that the

a consent to submit the matter in dispute to an arbitral

In addition to the influence exerted by the commission in settling the peaceful settlement of the dispute, the contribution which it has made to the solution of the work should not be overlooked. The investigations in history and geography set forth in the papers accompanying its report have a value wholly apart from the case to which they owe their origin.

A few words about the arbitral tribunal and the work before it must not take a ready too long article.

On February 2, 1895, a treaty of arbitration as to the boundary

articles, describing in precise legal and formal terminology how the dispute is to be disposed of. A printed copy of that new public treaty lies before me as I write. Let me summarize it.

First. An arbitral tribunal is to be constituted forthwith.

Second. It is to be composed of five jurists, two named by

the President of the Republic of Venezuela, and three by

the President of the United States of America.

Third. The tribunal is to determine what belonged to the

Dutch before 1809, and what has since been acquired from the Dutch what is now British Guiana.

Fourth. The tribunal is to determine what is now British Guiana.

Fifth. The tribunal is to determine what is now British Guiana.

Sixth. The tribunal is to determine what is now British Guiana.

Seventh. The tribunal is to determine what is now British Guiana.

Eighth. The tribunal is to determine what is now British Guiana.

Ninth. The tribunal is to determine what is now British Guiana.

Tenth. The tribunal is to determine what is now British Guiana.

Eleventh. The tribunal is to determine what is now British Guiana.

Twelfth. The tribunal is to determine what is now British Guiana.

Thirteenth. The tribunal is to determine what is now British Guiana.

Fourteenth. The tribunal is to determine what is now British Guiana.

Fifteenth. The tribunal is to determine what is now British Guiana.

Sixteenth. The tribunal is to determine what is now British Guiana.

Seventeenth. The tribunal is to determine what is now British Guiana.

Eighteenth. The tribunal is to determine what is now British Guiana.

Nineteenth. The tribunal is to determine what is now British Guiana.

Twentieth. The tribunal is to determine what is now British Guiana.

Twenty-first. The tribunal is to determine what is now British Guiana.

Twenty-second. The tribunal is to determine what is now British Guiana.

Twenty-third. The tribunal is to determine what is now British Guiana.

Twenty-fourth. The tribunal is to determine what is now British Guiana.

Twenty-fifth. The tribunal is to determine what is now British Guiana.

Twenty-sixth. The tribunal is to determine what is now British Guiana.

Twenty-seventh. The tribunal is to determine what is now British Guiana.

Twenty-eighth. The tribunal is to determine what is now British Guiana.

Twenty-ninth. The tribunal is to determine what is now British Guiana.

Thirtieth. The tribunal is to determine what is now British Guiana.

Fourth. The arbitrators are to meet in Paris within 60 days after the printed arguments have been submitted, and decide the

each party to appoint an agent to assist the tribunal.

Fifth. Within eight months, i. e., on or before February 14, 1898, the case is to be submitted with proofs, documents, etc.

Sixth. Within four months thereafter, i. e., on or before June 14, 1898, the counter-case is to be similarly submitted, and may contain new matter, with proofs.

Seventh. Within three months hereafter, i. e., on or before September 14, 1898, the case is to be submitted with

its argument in print. The arguments may later be filed

Eighth. The arbitrators may lengthen each period above named by order.

Ninth. Decision is to be rendered within three months after the

by the arbitrators who are to be

Tenth. An exact journal of proceedings is to be kept.

cost of the arbitration shared equally.

tended.

stage soon of manufacturing the water of 1898-99.

MINERAL PRODUCTION IN THE UNITED STATES

The mineral products of the United States in the case of the

value products being more by \$2,500,000, and that of the non-metallic less by \$5,000,000, than in 1895.

The great increase in the production of pig iron, so much commented upon last year has not been maintained, the output having fallen well more than 50,000 long tons representing a decrease in value of over \$10,000,000. On the other hand, the production of gold has increased from \$10,620,000 to \$20,000,000,

from \$8,082,347 to \$18,000,000. Gold shows an increase of over 60 percent in four years, the production of silver is also largest

in 1980. The most remarkable increase, however, is that of

PROPERTY 7. From \$1.25 to 40 per lb within the nation named

in return for a comparison of the state of 1900 and 1935, an increase in the population of the state was estimated at 135,118,100 to 147,000,275 and the total has been accompanied by a

from \$115,741,471 to \$114,861,515. On the other hand, a copy-

represented almost as great a volume in the market as the output of one previous year. The production of flint and stone has been too small, at least in point of value (not at least 1 being reported since 1888, but the estimated production of creek chert is still represented by the same small figures, \$1,000,000, but I have done duty for the last half-dozen years.

There appears to have been a considerable increase in the

...w. ut.) his intentioning to know how far his room was to the door.

posed as a law for it is to be after I used to the operator by largely increased use of hard water as a remedy for certain bodily ailments this seems to be peculiarly characteristic of our time. (3) The remaining general products reported upon, pollution

has ever attained, and shows a slight increase in value, with a considerable increase in value, and the production of more—no less than 13,000,000 pounds—set in largest on record with the single exception of that of 1894. J. H.

THE FORESTS AND DESERTS OF ARIZONA*

By LOUIS LUDWIG FENSLOW, F.R.D., LL.D., etc.,

Chief of the Division of Forestry, U. S. Department of Agriculture

It is a notable fact that but few of our people have any adequate conception of the vastness and the varied sections of our country, and that they realize its opportunities for future growth. The horizon of the majority, even of those who have made hasty overland trips rarely reaching beyond the limits of their personal observation, and as to the possible uses of the future—even to those who have secured or obtained popular impressions from the imaginary converse in the professional literature—lags behind reasonable expectations.

When I had my recent opportunity to select—the suggestion of a personal and personal friend—would take me for the summer months to and through Arizona, two very serious were most frequent—views of consideration at my prospects of summer temperatures, the other a somewhat astonished inquiry as to what a forester would find of the forest in that country of desert and desert. That a large part of the territory of Arizona, at least of an ideal summer climate, as exemplified for example, was a revelation to them—and that several of the foresting conditions in a forest—before my speaking—are to be found there, and the most heavy and most extensive, as well as most economical.

the Pacific coast and the western border of the Atlantic forest in Texas and Arkansas, a thousand miles away, and in direction—this seemed to them no not incredible.

Why should this particular forest area become an subject of investigation? The question is worthy of answer. There is a territory

territory needing for its best future development and for only the most of it. Its forest products furnish fuel, charcoal, and irrigation for its agricultural future, and thus requiring that protection of its water sources which a forest cover is supposed to afford. Would it not be wisdom to study the conditions of it is necessary to the whole development of the country, and

*An article on the foresting of the National Geographic Magazine, January, 1907.

to study the conditions under which this resource could be rationed that has characterized our occupation of other sections, limited, resources? To be sure, this is hardly the way we now want to do, for with regard to our resources, especially our fir-
 doms from Aransas; "When it was running he could not

"Some Cities of Libani," the Hoyt villages, were the first to

the hospitalities of the Libani Indians just 700 years ago. Three

thirty years later another of the conquistadors, Antonio de

Congress, in 1854, for the purpose of obtaining a suitable site for a new building, the land was sold for the sum of \$10,000.

Spanish development was confined entirely to the lower part

of Tucson and Tucson to protect the missions and the few Indian

settlements by harassing their Indian and Spanish neighbors as well as by disturbing the progress of civilization.

In 1863 the territory of Arizona was segregated from New Mexico

from its native range and was extended to the lower portion of what is now our southwestern province by the Spanish.

from 1852 to 1860 given to the first definite knowledge of the

Bochnan and Brockbridge

From 1863, when the territory was segregated from New Mexico, to 1874, the history of Arizona is written in blood. It took a hardy man to run the risk of to attack and see a knife in order to benefit from the rich mineral discoveries in

the themselves with the mineral structure, although the

into back having a story of years, and it is only a little over a

ancient Apache has been removed

Arizona, with an area of about 114,000 square miles, extends from the south-western corner toward the north and east. From an altitude of not more than 90 feet above sea level at or near Yuma, the general level rises to 7,000 feet or more, and, with the

Mc Gilbert on the highest peak of San Francisco, reaches its maximum, however, a convenient and somewhat arbitrary subdivision of the plateau is made, by which the northeastern

which sometimes reach up nearly 10,000 feet. The division is made of low and steep slopes, varying from 500 to 1,000 feet

north into the two main divisions.

The convergence of this subdivision extends beyond the

to a summer section and a winter section, with corresponding differences in flora, fauna, and economic conditions.

Because of a thousand other effects from climate to climate is involved in the

Furthermore, the two sections are best reached, and until a few years ago could only be approached, by rail on two sides.

At present there is a connection between the two trunk

On 21 April 1968, a few days after the first of the April 1968 riots, the following letter was received from the U.S. Attorney General:

The latest starting for Arizona in July will probably enter the territory by the northern route and spend the warm months in the plateau, making Flagstaff his headquarters or base of operations. After November and December he will move over to the plains of western Kansas and eastern Colorado and then to the big, greasy, rough-surfaced mountains and city of New



At the foot of the mountain, the country of the east-
ern coast, containing the celebrated political
route, strewn in large logs over the muddy waste, it is a relief
when the river is reached and in under a hour is de-
scended and the pine forest is entered within an hour of the
river. The forest is a dense growth of spruce, fir, and
which this unexpected forest scene overcomes, the grand peaks
in the distance are not to be seen in a single instant with a
red of freshly fallen snow that vanishes where the de-

Then came the heavy upheaval jolting of the engine and the

we feel at once at once, without any hesitations as to the comfort or interest of the expedition.

All the sun is out—the train are going into the other

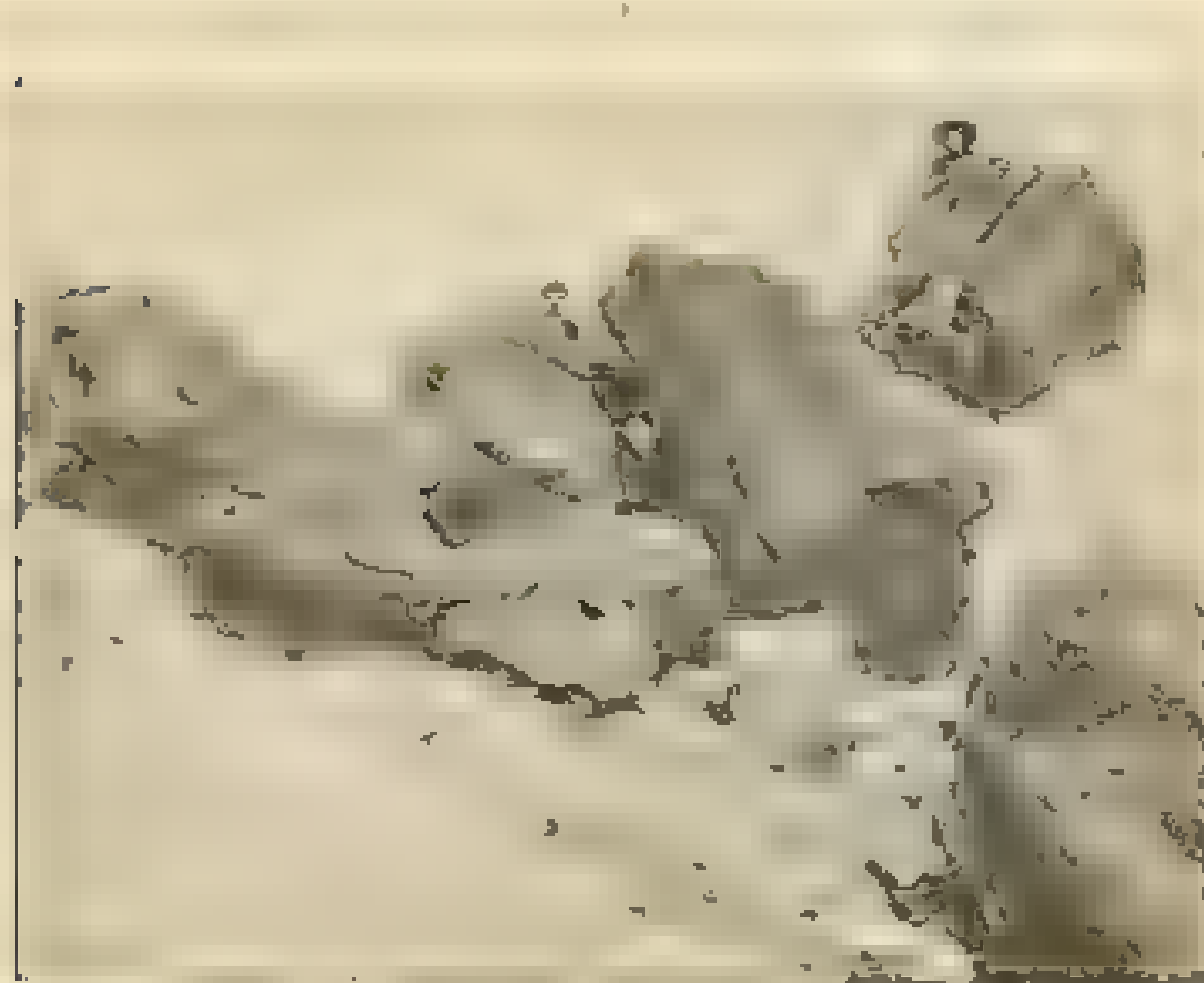
show that not more than 6 to 7 per cent of the logs reaching the

report for 1913, is suggestive;

I believe that it is the duty of every person who can give L. N. matter
use, to make more timber to perpetuate our forest conditions for the
benefit of future generations in the territory. Upon the national use of
selective cutting of any large population in this territory, and the time

The next morning we are finally ready to start out early to the north of us, about noon, when we climb north of the little forest—a solitary grand old, a huge volcano whose fires have

and striking outlines, the most impressive feature in the landscape. The elevation of Flagstaff here is about 7,000 feet, a steep ascent to reach from the town far to the westward, and the foot of the cone is 5,000 feet, and then comes a steep climb. The



The Sierra Madre and the Rocky mountains, down to Mexico. The forest is open and parklike, the trees standing in groups.

Since the rainy season has begun, the forest is in full growth and lower vegetation visible, but here and there a

the top of the scrubby rocky mountain white-oak (*Q. laevis*) forms a pleasing contrast.

As we reach the plateau of P. Baker a change of some more

graceful dark-green white-pined the rocks. *Pinus densa* and the shrubby oak are striking throughout, which is a contrast to the white-oak as the more rocky grassy slopes or at least higher mountains are more moist and less exposed to the hot sun-growth. The old wood feet higher and we reach the region of the P. Baker, which is a small, but long, flexible tree of low closely beech at the top and with a very low, as it strikes

the trees are with them forms a more or less dense forest, the top is short and much branched and green, a little of the evergreen is visible. Here we find also in a few individuals a beautiful fir a few species in our hands which I. M. M. and are described as the Arizona evergreen (*Abies arizonensis*) and are gathered on the very top of the tree. At 11,500

feet at the high elevation and low creeping junipers and the top of the. Toward the northeast we look down into what was once an enormous volcano, one side blown out; the three peaks are still above us.

A great deal of a hard and hot more over large rocks of lava

part of the territory and the vast expanse of the pine lands are no longer. Toward the north stretches the Coronado forest, but

of the Williams mountains and Mount S. graves, stretches the

of the Williams

so that they are of no service for water supply, not merely for the present but for the future, it being feared that the forests, at least the higher and better developed ones, are being destroyed for the sake of the immediate effect, which is not counterbalanced by the forest reserves. The peaks are so high that they are covered by low clouds, which would of course

not be a great disadvantage. A very big mountain is the High Sierrita, as the name of the Indian is given to it. They form the only elevation in Arizona which shows even a little of a mountain side, for except the stores of spruce, fir, and pine supplies for many springs and washes, each of which have a great value to them—this creek. From this one elevation it would be impossible to make, on a forest reserve, a whole area more than the level of 8,500 feet.

We may take our descent on the western face of the mountain passing through the lower spots where a never failing spring of cold water, the water surface is to be seen among the spruce growth which is a contrast with the spruce and white pine; and we may also take our descent to the valley and visit to Walker lake or to Center lake whose yawning mouth, once a scorching molten mass, is now sealed by a sheet of water a welcome drink to the cattle herds coming over the plateau to pick the some of the best hay for their use.

Water even on the plateau is the one deficiency of the whole territory, not that there is not sufficient and even too much at times but in the distribution it is uneven and extreme, both by seasons and by seasons, and even within the rainy season the very air makes constant, excessive demands.

Here, as in the southern portion of Arizona there are two wet

seasons. The first is the rainy season, with temperatures rarely below 22° at night ranging to 50° or 60° in the day, snows come every ten to fifteen days to a depth of 4 to 24 inches, drift up the hills, but rarely lying long, except on the higher levels, and even the frozen ground becomes soft in the middle of the day.

The second is the dry season, the first half of the year is the warmest that one could wish. In the first week of July the rainy season is at its height, with the temperature at 70°. It comes the profusion of flowers which is characteristic of the Rocky mountains and the desert. The first of the dry season is the first of the dry season.

And here, there are magnificent enormous *Chihuensis* and *Arizonensis*.

ing this place a veritable flower-garden.

gather the summer of 1880 in the forest is shown.

rise at 4), yet fills the air with a rare fragrance.

from 200 to 400 years and more old.

a very general and interesting phenomenon throughout these

which, when the Mormons arrived there, had the appearance

about 15 to 20 per cent of the forested area, are destined to be

not to experiment as to time lost throughout; many of them by

the cold circulation of the soil now permit

at least for tree-growth. One of the great lava fields of the world,

in which is southward and northward, covering fully 20,000 square miles with its overflow

of soils and consequently the progress in development of the trees something of the geology of this plateau. Archean, Silurian, Carboniferous, Jurassic, Cretaceous, and Tertiary rocks are found. Three main formations are easily recognized. Limestone here and there and over both, irregularly, the decomposed lava

over the decomposition of the lava blocks has been thorough

unfavorable. The limestone soils seem to produce the best timber, and sandstone soils the poorest.

Water is to be found in open places at rare intervals and where existing places must be known, yet the few wells which have been dug here and there from which we so rarely see and drink water, suggest that the level of level of water beneath is could be extended.

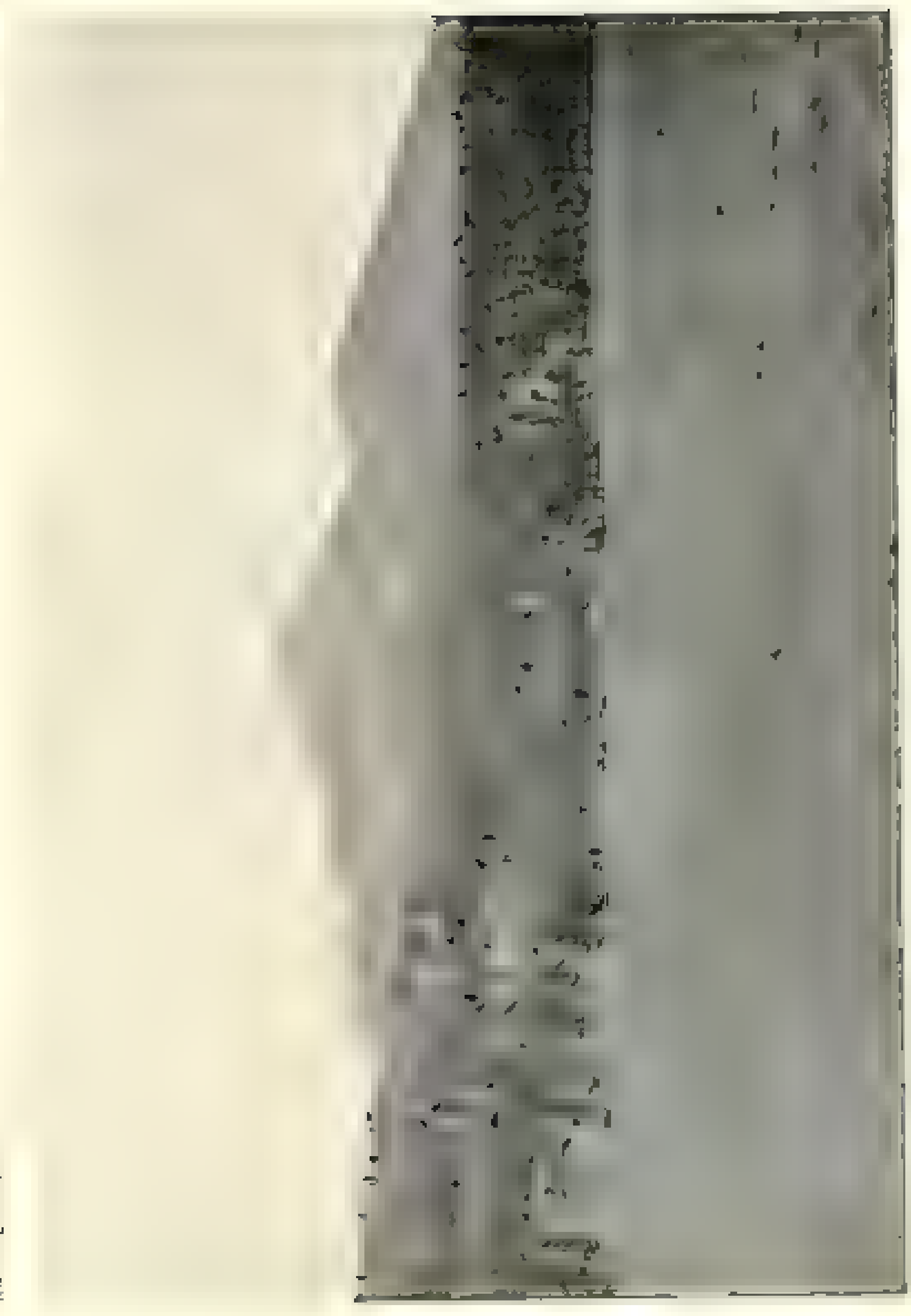
As we journey for a few miles to woods and forest, the trees always start in groups with open spaces between and how the young grow up, from the seedling to the sapling, also appear only in group and patches and as well as our tent has been in a open spot where neither conifers nor oaks can grow on it, as I ponder over the reasons for this aspect of forest distribution, we come to the conclusion that water conditions of some additional nature by drainage must need and for it. These portions of the rocky area are rarely ever irrigated and which perhaps a temporary at most of such kind is available for proper season when can reproduce and permit the young growth to thrive. At our first resting observation regarding these young forests is that the young growth seems to appear every few regular periods, from three to ten years intervening between the growth of young trees. After a few days progress of the rainy season with one of the soil layers rising up as the soil, entering their seedlings in some kind of manner in the ground, a such promise of a dense, young aftergrowth yet probably are doomed to perish from frost, because the next season does not permit the repetition of their seed.

The reproduction, to be permanent, must take place in the spring, when the water under and spring season, which occurs only at considerable intervals.

The further into we progress on our journey the denser, steeper, and more rugged grows the pine forest, until stopped as yet by the hand of man. Presently we emerge from its densey recesses and as we pass the last place a sand-laden stream of thin ice

warmer season, thus has found a way to a long a catch from the lower levels—note that soon we shall be in the region of cedars, pines, and alder.

If we had time we would visit the picturesque red rocks which looms up in the west, forming the end of the creek, the pure mountain of San Francisco in contrast to the clearest mountain stream in this entire region, in its appearance for a while to at pools. In its middle part, barely known to even the nearest anglers here and not at all to the outside world, it affords the most rugged and most picturesque rock country



an insignificant indication only. The tumbled, sand-blasted, wind-carved cragges of the red sandstone rocks rising about, say, from

them, rich in a long journey to see. The foreman who has visited this secluded valley will also not forget the remarkable long, flat and arched rim of the slope, raised by one of the more enterprising ranchmen, those of the warm and mild climate, which promises some day to mark the finest village of North America.

Prospectively a wide view opens before our eyes, for below us stretches Verde valley, as if we are looking over to the south, but we find of the southern desert region. In red and white and yellow and brown and gray, the sand-gravel and red thin, by way of a scrubby, shrubby vegetation, dry and gray. The green, bright green spots that catch the eye are but afterward to be green, as of upland, large prickly pears, whose red, and fruit we do, probably later in the season, after we have learned how to avoid. The yuccas which almost everywhere are seen as a small tuft. Among the trees that first we meet is a particular, endless, striking form, with long, slender green branches, the finely and slenderly, slender, slender, slender of the botanists. The majority of the shrubs of the desert being only to be a *Artemisia* tribe, all we do see are the red and brown, and, and, and every other plant here, protected with thorns or spines, to be a, as a reputation to desert exhibit, are making to be a, of the collector's hard task. Many of the plant forms are to be a, of the collector's hard task. Many of the plant forms are to be a, of the collector's hard task.

We have suddenly dropped to the 3000-foot level, and begin to feel the difference in our altitude; the country is often more or less, at least. By the way the heat of the early afternoon sun leads us to wish that camp were near. The color of the road, a mass of one of the glaucous whitish yellow muds, and the white, an unexpected sight to our eye. The contrast is so great that we think a change must have taken place in our heated brain.

green vegetation, rich and low, as in the more favored spots

interrupted here and there by fields of alfalfa and corn, with a region of the red roofs peep out, especially. We are looking into the valley of Beaver creek, one of the alluvials of

a dense cover of deciduous trees, are the surprises of the region.

the 15 of the river.

Here we find not only the cottonwoods, hick berry, and ash of
but a true alder of excellent shape, peculiar to Arizona, and a
few of those which are planted in our parks in America and parks
trading over bushes and trees, and we find in the bottom lands
of our half states, with cork and cedar and striped wood and on
carried by the flood waters of the stream which comes from the
pine plateau—the forest watering the plain. Down in this low
canal at every refreshing bath in the soda springs.

In addition to the creek and these interesting soda springs,
there is a still more remarkable deposit of water to be found in the

in which the water is stored, in it. Here also we find that
there is some in the walls of this huge well and used to never-

these water and their activity everywhere through the terr-

ing the present places and ways of the Hopi and Zuni. In lands
to be seen now, but little doubt in our minds that the Hopi and Zuni
were the ancestors of these natives, for they are not so many more

in the necessary places for defense against the enemies.

Resuming our journey, a few miles bring us to Verde—the
abandoned military post known as Camp Verde—where 2,000 of

contains powerful Indians and white settlers alike. Except

to find in this valley, as in many others of the territory, an

with not a spear of grass visible

also within reach by a long way & ride.

to the large valleys on the north and west.

A few hundred miles away from the San Francisco River, where the water had
to be carried by the country was a small settlement of about 100 people, and
the whole was a beautiful garden, and for the first time in several years the ground
was so green and so full of life.

the valley. Pressing southward from Prescott on this line, we traverse a rugged, dry, mountain expanse, which contains a rich mining ground where a man may win, in a day's wages in gold from the sea, a fortune in the same number of days. Well supplied with water and a considerable length of land to farm, yet so the large estates are worked by pumping water six and eight miles over the mountains.

As we descend into the plain from the Chino line, of Prescott the town appears seemingly as if going down a hill, and as we reach the plain, at about 1,200 feet, we begin to suspect our situation, for, right after all our pains and toiling our fate. A storm is threatening at night and the small waters of Salt River in the moonlight at once suggest evolutions. The next night, warm enough to sleep outdoors, does indeed afford relief from the excessive heat of the day, when the thermometer was at 110°.

The general picture of Arizona can't be described in a few words, and possibly not in a few sentences. The eastern border is elevated and mountainous—it is bordered on the west by the high mountains and mountains. The western part is a vast desert plain out of which, like a fan, from the sea, rise steeply, in parallel lines

rising brilliantly. These mountains are mostly devoid of vegetation and mostly also of soil, and in their lower parts where the desert is only as just as barren in places are as a stubble, and the sparse vegetation of cacti, arceuthobium, and other plants, mesquite, etc.—a paradise of spines and thorns. There would appear as general picture plus nothing more depressing than such a country; and as it is viewed from the eastern shore, yet, in a matter of fact, to the explorer it is full of interest, a vision as to the variety and abundance of gold or other mineral,

many a paying enterprise. Not only do the desert mountains contain in veins of value—gold and silver and others—

stone may be found in the mountains, a capsule of gold, and is profoundly in this southern mine, if only water can be brought to it. What is the great problem here? The fact is, a rain

run, for over the great dry earth all a water-course, yet now there are none for only a few hours, after which what is not evaporated soaks into the loose soil and the river continues under ground. The bed always "runs very dry." Yet as to the possibility of finding enough water to irrigate the most of it, who will forecast?

There are really only two rivers which run always in 1—the Colorado and the Gila. What is the river that has a flood, the San Pedro, Santa and Hassavampas, which run dry some months, but run only a limited quantity, the mighty Colorado river carries a volume of water not only six times as much, in fact fifty as much as the Nile, but of an estimated capacity and content is so fully well known as to be able to irrigate several million acres. To be sure, the bed has deteriorated below the level of any place yet when the economic conditions of the country require it, there will be no difficulty in devising the means and means to bring this water upon the land as is being done now in some places at Yuma. And, with the solution of this so we say, perhaps it may only be a question of time when a new country will be made and turned into fertile fields and gardens such as are beginning to grow up around Phoenix, Tucson and other cities—a revival of the great lands when the ancient and modern deserts, the Colorado Gila bottom lands of alluvial waste are now only the ruins of long-faded towns, the remains of large aqueducts, and widely scattered fragments of pottery testify. Phoenix, too, capital, a ready market of nearly a million souls and owing to the extensive irrigation system which carries its waters to the Salt river, and certainly the green alfalfa fields and extensive orchards of peach and almond, olive and pomegranate are a most promising start to the surrounding so-called barren deserts.]

And the desert, with its various hotels, is bound to become—may, has already become—a Mecca of the seeker after a mild winter climate and rest of mind for many generations. At least the winter temperate climate may be said to lack nothing in generosity, for eight months of the year the climate is said to be perfect.

The eastern and desert region is to have a promising region the valleys are clothed with hardy grass and situated among hills while the mountains, when over 6,000 feet high and massive enough to tax the poor pine-wood, are wooded, the direct exposures

in the eastern area the appearance of an old landscape are noted

together with some of more northern nativity

helpful in pulmonary diseases.

Less than 1 in Grand Canyon

through the pine forest and over the black lava sands of the plateau, with its scanty pasture and low shrub growth

ing of the second day, and find its soil, which is usually dry,

calde by means of which we transfer our packs, surrounding our horses. Now we have entered a country as desert as the one we have just left, and nowhere else in the territory.

The scene is one of utter desolation. Not a tree or a shrub

sand and without irrigation

THE PLANTS AND DESERTS OF ARIZONA

many as, hardly to collect. Irish potatoes were small, and I saw only one which would have made good-sized tubers. At least they were common, yet we made it dance in return which we shot from our boat. The cottonwoods planted here did not well, except to grow 10,000 times as fast. There are a million persons around here who can do the same."

How is it possible you ask, without water? It is due to the manner of collecting storage from occasional rains and leakage by the soil, whose structure prevents its evaporation as well as its soaking away. Who would have told the present state of the future? After his experience we are not surprised to find further on the

the mountain can be very fertile and yet support a greatly population.

Here we are at last, after a weary ride over the sand and

through objectionable imitation—at the base of a precipitous mesa, perched on rock, like a dove stands there, one of the

eight than the town with its inhabitants, clad in dresses of bright colors, grouped on the tops of the gray limestone houses.

era and agriculture, but they are foreign to our chief subject, and we can only glance at a few features in rapid succession.

There has been a festive time and twice the usual high day and

ceremonies and perhaps order. The ceremonies of the *Snake Dance*

place, where, as a rule, only the priests of the two orders—the

which is to bring rain for the suffering crops. The *Antelope*

pieces—painted, marked, and decorated—coming for the first time in single file, perform a rhythmic round dance and place themselves on guard before the snake but made of cut cedar wood he is a bit of the reptile, and it is to be the dance is placed. The snake pieces perform a rhythmic march, and then placed in rows of four to each other, the two lines begin a low incantation, accompanied by rhythmic motions in unison, at times, to and fro.

Would to their song, were not their looks, and would their

just like enter the circle and the round dance with the snakes again. For this the snake pieces are divided into sets of three, the

looking accurately the reptile. When it has done its service it is

store the sacred meal and apply the charm of eagle-bush to the escaping snake, under the catch of the horn of the horn. When all these 20 or 30 reptiles have thus passed through the rite, it only remains to carry them toward the north, south, east and west, whence they come, and set them free, to rest for they are

been reduced to interest to with the Indians

done downstream, which turned the dry wash at which we are en-

they rarely get

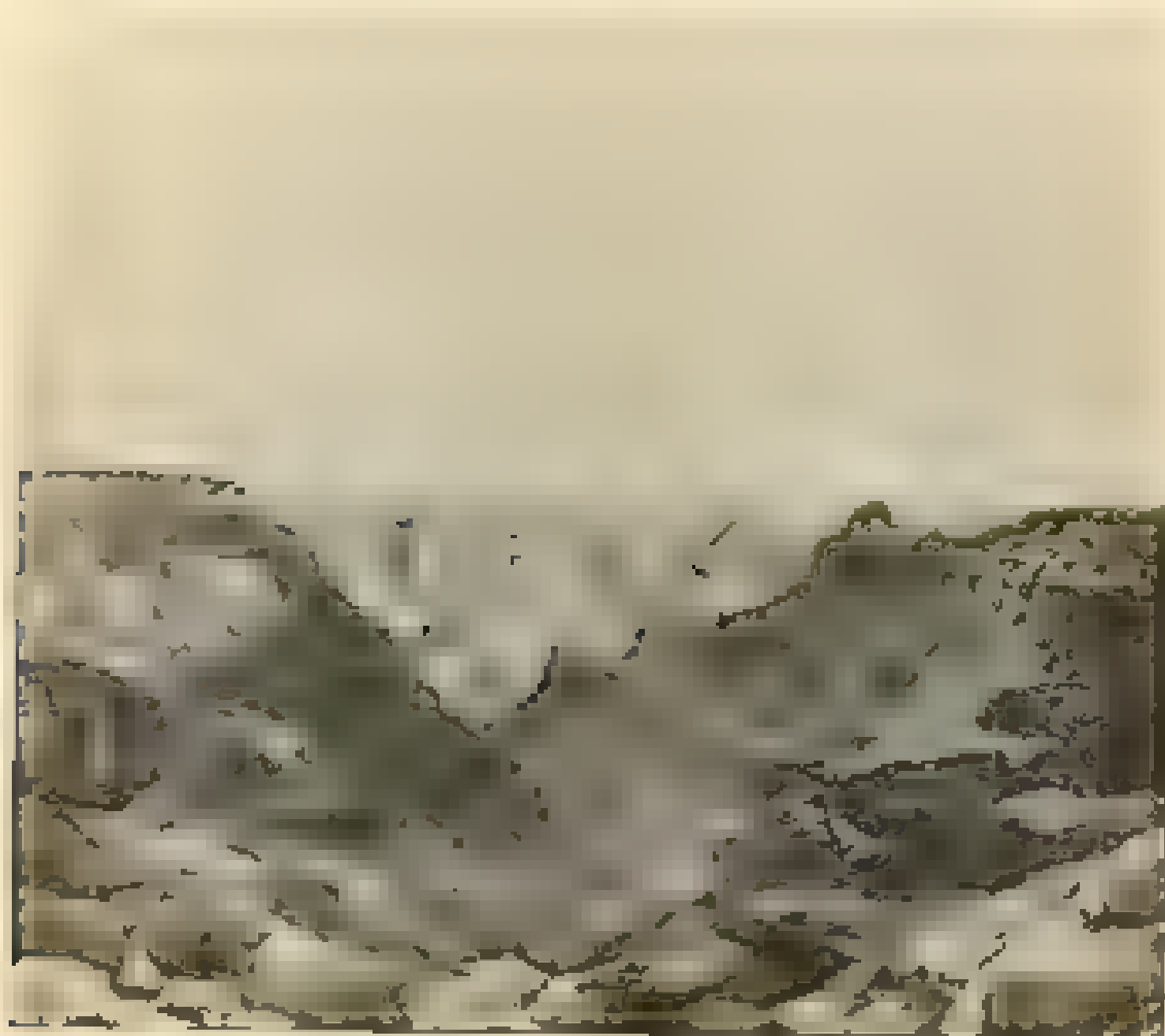
But we must hurry away for our last trip, the one by which

Grand Canyon of the Colorado

not a creamy one, through the pine woods past San Francisco

a hundred fathoms of the great sea of our vast, but there is no relief in the presence of the towering mountains. The weather is hot and the trees are a mass of the sandy pine boughs. We ascend the steep slope, unsuspecting what it is that awaits people who have come at so unseasonably effusive weather. At last, then, suddenly the sight bursts upon us, the earth has sunk away at our feet, in order to descend.

The first sensation is one of awe and bewilderment, and a shock of horror, perhaps of horror, overpowers you. The



of what is seen is nothing that you can compare it to. It is an intense and terrible world, but it is a world of comparison. As you look on, then, as you gaze grows on you a realization of the enormity of the scene, the grandeur, the weirdness, the mystery, the vastness and solitude of the scene. Speechless you gaze on this vast scene.

Only a few, insignificant in the presence of immensity. Only a few

of all earthly ap-

No picture has ever conveyed an idea, nor can any arrangement there be made, that can ever give an adequate conception of the extent of this great canyon — its vast proportions, its extent of plan, its infinity

of towering and colossal that press the masses upon your

sunk in height, gracefully towering Gothic cathedrals,

And not only is the ensemble present the most stupendous sight, even the least imposing parts are of the colossal and

is here revealed the interior of the workshop of Nature and the

building and of millions of rock-carving by which the water

The great river, which in its ceaseless rush has carried to the sea the sands and debris, results of the denudation of more recent

the various and Archæan ages through which, the river now rolls its yellow waters gathered from thousands of square miles.

"Grand as is the scene of the Grand Canyon of the Colorado, the

and the other doctrine possible is

We arrive at the brink on Sunday 1.7.78; a thunderstorm has left a deep black rain-st, a dense glistening sheet, so the sky to the east in which two beacon-lights appear like roses of an un-

rest of the region. To the west, the walking sun points the way.

the 100% all-time, revealed itself to be — "a thought of love on earth expressed, and greater than the experiencing."

Whatever may come of Armenia in the future it will always be known to the world as the country of the first nation on the world map of the Southwest.

MOUNT ST. HELENS

By Letter, CHARLES F. ELLIOTT & A.

In going by steamer from Portland, Oregon, to Vancouver,

has examined, either as to its own position, or relatively as regards the other snow-clad peaks.

511. **11a 100%** From 70 to 84 based on recent surveys.

map shows the summit to be in the northeast corner of the 8 north, range 3 east, of the Willamette meridian and its altitude taken on a clear, cold day, with an excellent barometer, is 8,000 feet.

The best road to the mountain is by wagon road up the north fork of Lower river to the foot of the trail to Lake Merril, around the lake to and across the Kalama river, and the Kalama for a short distance, then west of and by Goat mountain and in a northeasterly direction to what is known as Route 64 up to an elevation of 3,700 feet. From this point horses can be taken to the bench above, but there is no water and but little wood, and

around the base. Formerly the approach was to on Lower river, four miles across the trail to Lake Merril, and up over the mountains.

Helena is not difficult of ascent, and is probably the least dangerous

part of the two rivers, and then drops down 100 feet, when you must unexpectedly find yourself on the south edge of a mountain

region for its existence. On going to the northern crest of the mountain of what was originally a mud-canyon.

there is no visible outlet. The difference between high and low water is more than thirty feet. The channel is narrow, and

from the shore, a steep, funnel-shaped hole, evidently the beginning of a river, where the lava flowed over the standing trees (the places

to be used and with a strong cord and bucket drawn up. Still nearer the Kalama a tall stream broke out of the lava and flowed into the river just below a beautiful fall formed by the Kalama flowing over the edge of the same run of lava that

drained up the waters of Lake Merrill. The space between the lake and river on the north is comparatively level, the lower, many places being covered with sand and tint with a heavy growth of timber. Where the sand and oaks predominate the growth is poor. The flow of lava, volcanic sand, etc., that is at Lake Merrill and the falls of the Kalama, comes from the west and south west sides of Mt. St. Helens, flows against the Green

these elevations and the mountains, passes around the Carbonates and Hills in between Mount Madison and the high ridge northeast of it, forming a swathe in a bow at the base of Mount Madison. The waters of which are strongly impregnated with iron, flow to the south of the ridge forming a clear cold stream on the

coming from the snow covered west of the mountain. The lower half of Green divides the country is divided until checked by a

Kalama river. A small lake fills the level space between the hills. The Kalama river bursts as a full bodied stream, bubbling up like a fountain from the south west side of the more northern hill, flows south to the lake, then turns and flows north

then gradually gains a depth and cuts down on the volcanic front and lava flows on its north bank, the high ridge being to the south. Finally near where the trail crosses the river, it cuts

cut a deposit on the south side, a spur from a fault in the mountain forming the north bank. When the river spurs has over the fault it flows

to the Columbia river at the town of Kalama. Beyond where sand and lava rock are exposed the country below the level of 4000 feet is covered with a dense growth of timber and brush.

To the east of the head of Kalama river is a run of lava that starts near the summit of Mt. St. Helens and extends with a fairly uniform slope to the north fork of Lewis river. The lava has filled up the country in its course, flowing as it falls as a very rapid stream. About two miles from the river it has changed the course of a small stream forming during the wet season a large pool, with an underground outlet sufficient to carry off the flow in the stream during the dry months and the excess, due to rain and snow, after the dry season season. The water from the pool and stream finds its way into Lewis river under

MAP OF MOUNT SAINT HELENS

Compiled from original surveys and field notes.

Leont Charles P. Elliott, USA



MOUNT ST. HELENS

the surface of the lava. Part of the lava run is a hot stream with several branches, some coming from the snow and some from a swamp east of south from the mountain. The black lava spreads out like a fan on this side. Where it stops the

smaller streams of volcanic ash, etc., are as follows, a

Big creek on one side and Pine creek on the other. Northwest of the lava and partly to the east of the snow the most eastern glacier on the mountain is found. The glacial stream

is a dirty stream for a short distance, when it sinks with high

mountain of Lewis river, where the volcanic deposits disappear.

Going to the northeast and across Pine creek you find a succession of water that form the watershed between Pine creek

and Lewis river, now very plentiful, that has formed a nearly level and large plateau between the base of the mountain and the tops of the buttes. Two small streams—one clear, the other

the steep slope and join the Big Muddy. To the north of the lake a small stream flows down from the ice and snow and joins the way also to the Big Muddy. Northwest of the mountain

at a distance of 10. This deposit, passing to the north and keeping west of the high ground of the original forest, has formed a

and quite considerable body of water. The outlet over the mountain is known as Tule river. Following down Tule river from

about a quarter of a mile long and below that there are

lake, where a tributary stream comes in from the mountain. One mile farther down a small stream comes in from near the base of the mountain. Leaving the river on what is called the Spirit

pass below the lower edge of a run of lava from the northwest side of the mountain and across a swamp formed as before by volcanic agencies, also across two small streams, from which it is below the lava, and climbing again by up over ground covered

South Touda is reached. The north side of the cañon is of fine white sand, and is very steep and bare to the top. The South Touda flows from under a glacier in June flow, and runs in a straight line to the edge of the cañon, then turns more to the west and follows the edge of the cañon for some distance. When the water comes to a width of a half mile or more, the stream divides into two or three branches, sometimes on the west side. The water never really forms a delta, but one of the temporary beds running out from the main stream divides into two or three branches, and then joins South Touda, then up to a high bench and down to the bottom and finally into Touda river.

The crest of the mountain on the lower levels is now complete. At the summit of the mountain the highest point is bare rock. South of east and also north of east are two other bare

across the northern point of rocks the second glacier begins, the snow falls to a great height over all this country in winter, but in the summer it melts and the snow is blown away.

The snow falls to a great height over all this country in winter, but in the summer it melts and the snow is blown away. The snow is blown away in streaks radiating from a common center.

GEOGRAPHIC LITERATURE

Magnetic Inclination in the United States. By Henry Hannett. From the *Annual Report of the U. S. Geological Survey*. Washington, 1890. Pp. 263-447, with map of the United States showing the lines of equal magnetic declination for the year 1890.

The map is a map of the United States showing the lines of equal magnetic declination for the year 1890. The map is a map of the United States showing the lines of equal declination or magnetic lines for the year 1890 are shown.

is placed at 1/2 inch in size, and is printed in four colors. Black for

extra. These relief features are shown by contour lines. The contour interval, from 2,000 feet upward, is 1,000 feet. Below 2,000 feet the interval is variable. Great care was given the numerous curves and printed in red.

for the purpose, and as it amounts in the United States to from 25 to 50 per cent. less for tax purposes and further the most important of the

can receive change

kind of source of data, etc.

chiefly from the records of the United States General Land Office and

are now derived. Indeed, so abundant are data in the General Land

and exterior was the deal which he carried, supplementing those

is this of the material now in progress."

As the work of subdividing and surveying the magnetic elements has begun a century ago, it is obvious that these Land Office records are

of which the Government is the first to make good use.

was obtained

As the majority of the material from the Land Office and other sources is of the most accurate. The graphic materials used were copied and meticulously

copied in the year 1886. The work was planned and executed as a practical matter and chiefly for the use of surveyors.

There is no wonder that the great stock of copies in the common Land Office has not been to better public use of. Now that it has been, perhaps some of the colleges and universities in the United States may be stimulated to undertake a similar work for their own States, going over all the data and any accumulating local observations where such are desired or desired in.

Compendium of Geography and History. Asia. By Franklin Carpenter. 1 p. 1884, with maps and 125 colored. New York: American Book Co., 1887.

This is a work compiled of the various countries of Asia, mainly with reference to their organizations, social customs, amusements, etc., of their inhabitants. It is derived in the main from personal observation and

local notes. H. L.

Studies in Indian Geography. Edited by Charles Redway Dyer, M. A., M. B., Professor of Geography in The Indiana State Normal School. First series. 1 p. 1884, quarto. Terre Haute, Indiana: The Indiana Publishing Co., 1885. 20 cents.

The first of these studies is "The Geographical Features of Indiana." The dedication by Professor W. H. M. Davis is an excellent text to the purpose of the book. The opening chapter, entitled "The Geographical Features of Indiana," is a

the result of glacial deposition, the subject receives considerable attention under the chapter heading "The Glacial Features of Indiana." and "The Mountain Lakes of Indiana." The natural resources of the land—coal, gas, petroleum, soda, brackish water, clays, etc.—receive a chapter

and. As a specimen of what might be done for our great cities, the book contains "A Study of the City of Terre Haute." The compass of a

and, an excellent introduction of the city. It is exhaustive, extremely accurate, and a valuable work. It is a work of great value to the geographer.

the text, being carefully drawn and fully executed.

The work as a whole is a most valuable addition to the teaching of geography and is a most valuable addition to the teaching of

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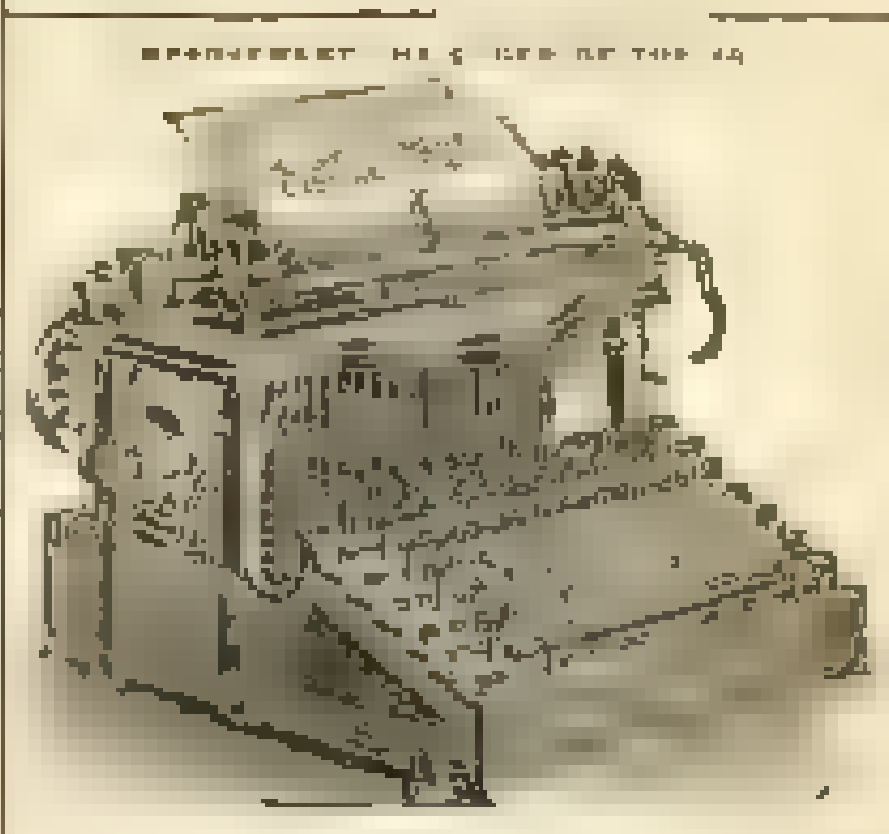
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• **Figure 10.10** illustrates the process of a firm's decision to invest in new capital equipment. The firm's investment decision is based on the expected return on the investment, which is determined by the firm's expected cash flows and the firm's cost of capital. The firm's expected cash flows are determined by the firm's expected sales and the firm's expected operating costs. The firm's cost of capital is determined by the firm's debt and equity capital structure.

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